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INTELLIGENCE MEMORANDUM

IMPLICATIONS OF THE PLANNED EXPANSION IN THE SOVIET MACHINE TOOL AND METALFORMING MACHINERY INDUSTRIES

CIA/RR IM-429

1 May 1956

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CIA/RR IM-429
(ORR Project 34.1033)

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IMPLICATIONS OF THE PLANNED EXPANSION IN THE SOVIET MACHINE TOOL AND METALFORMING MACHINERY INDUSTRIES*

Summary

In recent years the USSR has surpassed the US in production of machine tools. By 1960, planned Soviet production will be more than double the average annual US production during 1951-54 and probably will substantially exceed economically feasible US production in 1960. Production of metalforming machinery in the USSR in 1960 will be well below that in the US; the Soviet plan for 1960 calls for a production of about 45 percent of the average annual US production during 1951-54. In view of the past performance of the Soviet metalworking machinery industry,** the high priority that it receives, and the skill of its managers, the production goals appear to be within Soviet capabilities.*** During the next 5 years the level of technology in the metalworking machinery industry of the USSR is expected to be fully comparable to that of the US.

Based on the assumption of substantially increased rates of retirement and exports and on the fulfillment of the machine tool production goals of the Sixth Five Year Plan (1956-60), the Soviet inventory of machine tools probably will reach 2 million units in 1960, compared

* The estimates and conclusions contained in this memorandum represent the best judgment of ORR as of 15 April 1956.

** The metalworking machinery industry consists of two major branches: machine tools and metalforming machinery. The machine tool industry includes plants producing nonportable machinery which progressively removes chips, such as lathes, milling machines, shapers, and planers. Grinding, honing, and lapping machines also are included even though the chips removed are microscopic. The metalforming machinery industry includes plants producing nonportable machines which process metal by shaping or bending, such as hot and cold forging machinery; mechanical and hydraulic presses; and bending and forming, punching and shearing, and riveting machinery. 1/ (For serially numbered source references, see Appendix C.)

*** Comparisons of annual production do not imply a comparison of productive capacity. Both the US and the Soviet metalworking machinery industries, for example, could increase production considerably over present levels by more intensive use of facilities.

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with an estimated US inventory of 2.5 million to 2.6 million units in 1960. The average age of Soviet machine tools, however, will be less than that of US machine tools. The US inventory of metalforming machinery will be well above that of the USSR in 1960. Because a large proportion of US production of metalforming machinery is used in the consumer goods industries, however, the USSR could supply its military and capital goods industries without equaling US production.

Soviet plans call for the construction of 11 new metalworking machinery plants in the Urals and Siberia. If the planned goals are met, the proportion of Soviet production of machine tools in these areas will increase from about 10 percent of the total in 1954 to over 25 percent in 1960, and these areas will produce from 30 to 50 percent of the total Soviet production of metalforming machinery in 1960. The location of the new plants will help in the establishment of dispersed and fully integrated industrial centers in these areas.

Production of new types of machine tools will be important in the Soviet automation program. Development and production of new types of automatic machine tools, automatic lines, and transfer machinery will be carried out by organizations under the Ministry of Machine Tool Building and Tool Industry. In addition, the high level of planned production of metalworking machinery is intended to facilitate the program for extensive replacement and modernization of obsolete equipment.

Soviet plans, if met, will enable the USSR to increase considerably the flow of metalworking machinery for replacement and export and will permit the USSR to add machines to its inventory at a rate substantially exceeding the annual increases to the US inventory during the past few years.

I. Introduction.

A large, well-dispersed metalworking machinery industry is of key importance in providing the USSR with an economic base for war and with the ability to recuperate quickly after extensive industrial destruction. The significance of the metalworking machinery industry

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in maintaining a high rate of industrial growth and increasing the level of labor productivity has been widely stressed, most recently in the Soviet Sixth Five Year Plan (1956-60).

This memorandum assesses current and planned developments in the metalworking machinery industry of the USSR. Particular attention is paid to a comparison of the Soviet metalworking machinery industry with that of the US, the significance of new plant locations in the USSR, and the effects of the planned increase in production on the industrial economy of the USSR.

II. Current and Planned Production.

A. Comparison of Soviet and US Production.

Soviet production of metalworking machinery in 1955 was 118,500 units, of which 105,000 units were machine tools and 13,500 units were metalforming machines. The Sixth Five Year Plan calls for production of 200,000 machine tools and 25,800 metalforming machines by 1960, an increase of 91 percent in each category. 2/

The accompanying table* shows that annual Soviet production of machine tools has increased from approximately 82,000 units 3/ in 1951 to 105,000 units in 1955 and that production of metalforming machinery has increased from approximately 7,000 units in 1951 to 13,500 units in 1955. 4/ Annual US production of machine tools has fluctuated somewhat because of the Korean War. The figures for US production of metalforming machinery are heavily weighted with machines used in producing appliances and other consumer goods, unlike those for Soviet production. Machine tools, which are more important than metalforming machinery in the development of heavy industry, have made up about 90 percent of the total production of metalworking machinery in the USSR in recent years. In the US, where consumer goods production has received more emphasis than in the USSR, machine tools make up about 65 percent of the total production of metalworking machinery.

Figure 1** compares average annual US production of metalworking machinery during 1951-54 with actual Soviet production in 1955 and planned Soviet production in 1960. Annual US production of metalworking machinery varies substantially from year to year,

* The table follows on p. 4.
** Following p. 4.

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Table

Estimated Production of Machine Tools
and Metalforming Machinery in the USSR and the US
1951-60

Thousand Units

	Machine Tools		Metalforming Machinery	
Year	USSR a/	US b/	USSR c/	US b/
1951	82	82	7	56
1952	85	110	8	54
1953	88	90	9	58
1954	92	85	11	58
1955	105	80	13.5	N.A.
1956	115		15	
1957	130		17	
1958	145		20	
1959	170		23	
1960	200		25.8	

a. For 1951-55 the margin of error is plus or minus 5 percent; for 1956-60, plus or minus 10 percent.
b. For 1951-54 the margin of error is plus or minus 10 percent; for 1955, plus or minus 15 percent. All US manufacturers do not report production of machine tools. The National Machine Tool Builders Association, whose members produce about 85 percent of US production, does not make unit production figures available for the whole industry. US Bureau of the Census figures are not comparable with Soviet figures or, in fact, with other US figures, because of differences in definition. Estimates for US production of machine tools are adjusted figures from the National Machine Tool Builders Association (see Appendix B). Estimates for US production of metalforming machinery have been extracted from tables in the US Bureau of the Census Facts for Industry Series by totaling products similar to those known to be produced in the USSR.
c. For 1951-55 the margin of error is plus or minus 10 percent; for 1956-59, plus or minus 15 percent; for 1960, plus 5 to minus 20 percent.

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and a comparison of annual production is therefore not a reliable measure of productive capacity. Although the average annual US production of machine tools during 1951-54 was approximately 92,000 units, the industry has produced at a rate of over 300,000 units annually during wartime. The USSR, likewise, can increase production by more intensive use of facilities and multiple-shift operations. The present Soviet rate of production appears to be accomplished on the equivalent of a 1-1/2-shift basis. 5/ Moreover, the Soviet government has given the Soviet machine tool industry a high priority in all phases of production, and the managers of this industry appear to be competent.

By 1960, planned Soviet production of machine tools will be over 200 percent of the average annual US production during 1951-54. Planned Soviet production of metalforming machinery will be approximately 45 percent of the average annual US production during 1951-54. 6/

A major reason for the Soviet ability to produce a large number of machine tools is their concentration on a standard line of tools which may be manufactured on a continuous production-line, rather than a job-lot, basis. The following observation of a member of the US Automation Team recently returned from the USSR is pertinent 7/:

> In one plant /Krasnyy Proletariat Machine Tool Plant/ we visited we saw machine tools being produced in mass production. In one particular line, they were producing a machine similar to a Warner & Swasey screw machine or turret lathe. After being machined, the bed is placed on a walking beam, floor-type conveyor. As the machine progresses down the line, ways are scraped and the balance of the machine is completely assembled. This line can produce over 50 machine tools per day. They build about 1,000 machines per month.

Members of the automation team went on to point out that machine tools of this type generally are made on a job-lot basis in US industry in batches of 10 or 20 at one time. /The system used in the USSR has the important advantage of permitting the production of a great number of machine tools of one type, followed by a shift to production of machine tools of different types./

This efficient technique for producing machine tools seems to be reflected in Soviet prices. /An analysis of ruble-dollar price ratios for a number of comparable Soviet and US machine tools indicated

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that Soviet machine tools as a class probably are priced lower, relative to the US product, than any other category of goods. Ruble-dollar price ratios for 23 machine tools, representative of perhaps 60 percent of Soviet production, average about 4:1, compared with price ratios of about 8:1 to 9:1 for all capital goods and of about 20:1 for raw materials.*

Estimating US production in 1960 is not feasible, because annual US production of machine tools has been traditionally subject to major fluctuations. It is almost certain, however, that Soviet production will substantially exceed economically feasible US production in 1960 because the USSR is planning to maintain a higher rate of industrial growth than the US and is attempting to equal the US economic base for military production and US productivity in a short period of time.

Because the product mix of both US and Soviet production of machine tools has been constantly changing, an accurate comparison of the productive capacity which can be obtained from each country's annual production of machine tools is more difficult. Some small machine tools, such as those used in watchmaking, were not built on a production basis** in the USSR before 1954. Since 1954 these machines have been included in Soviet production figures. A few types of machines which are not classed as machine tools in the US are believed to have been included in the Soviet figures. It is estimated that Soviet production of these types of machines is approximately 2 percent of the reported total production. The error in comparability, however, is believed to be small.

Because much of the US production of metalforming machinery is used in the consumer goods industries, a comparison of annual US

* Ruble-dollar price ratios are actually indicative of relative production efficiencies only insofar as price ratios are proportional to cost ratios. Cost ratios, which are not obtainable, are needed for more accurate comparisons. It is known that capital goods in the USSR are underpriced, relative to consumer goods. Consequently, there is a bias in the comparison. It is believed, however, that the difference in levels of the several ruble-dollar price ratios given above are so large as to be significant regardless of the probable bias created by the fact that prices do not necessarily reflect costs in the USSR or in the US.

** In lots of 10 or more.

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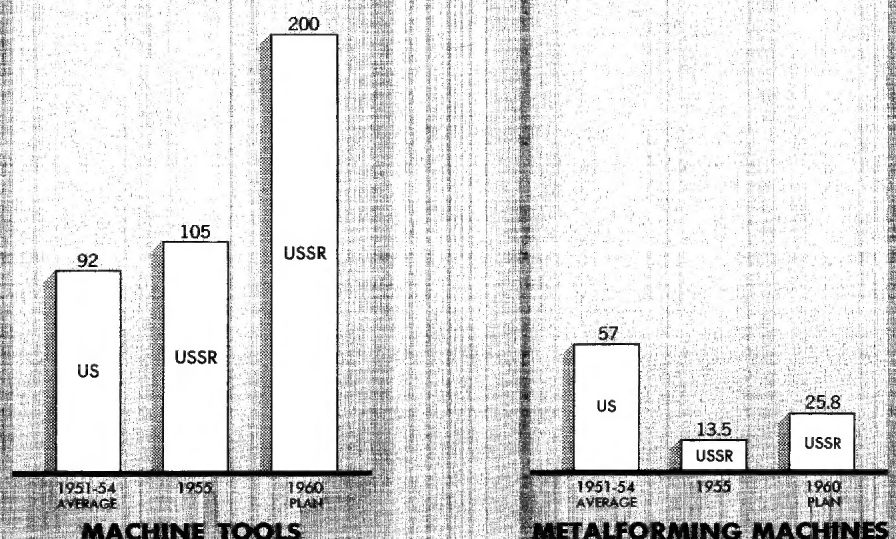
Figure 1

Comparison of US 1951-54 Average Production of Machine Tools and Metalforming Machinery with USSR 1955 Actual and 1960 Planned Production

(In thousands of units)



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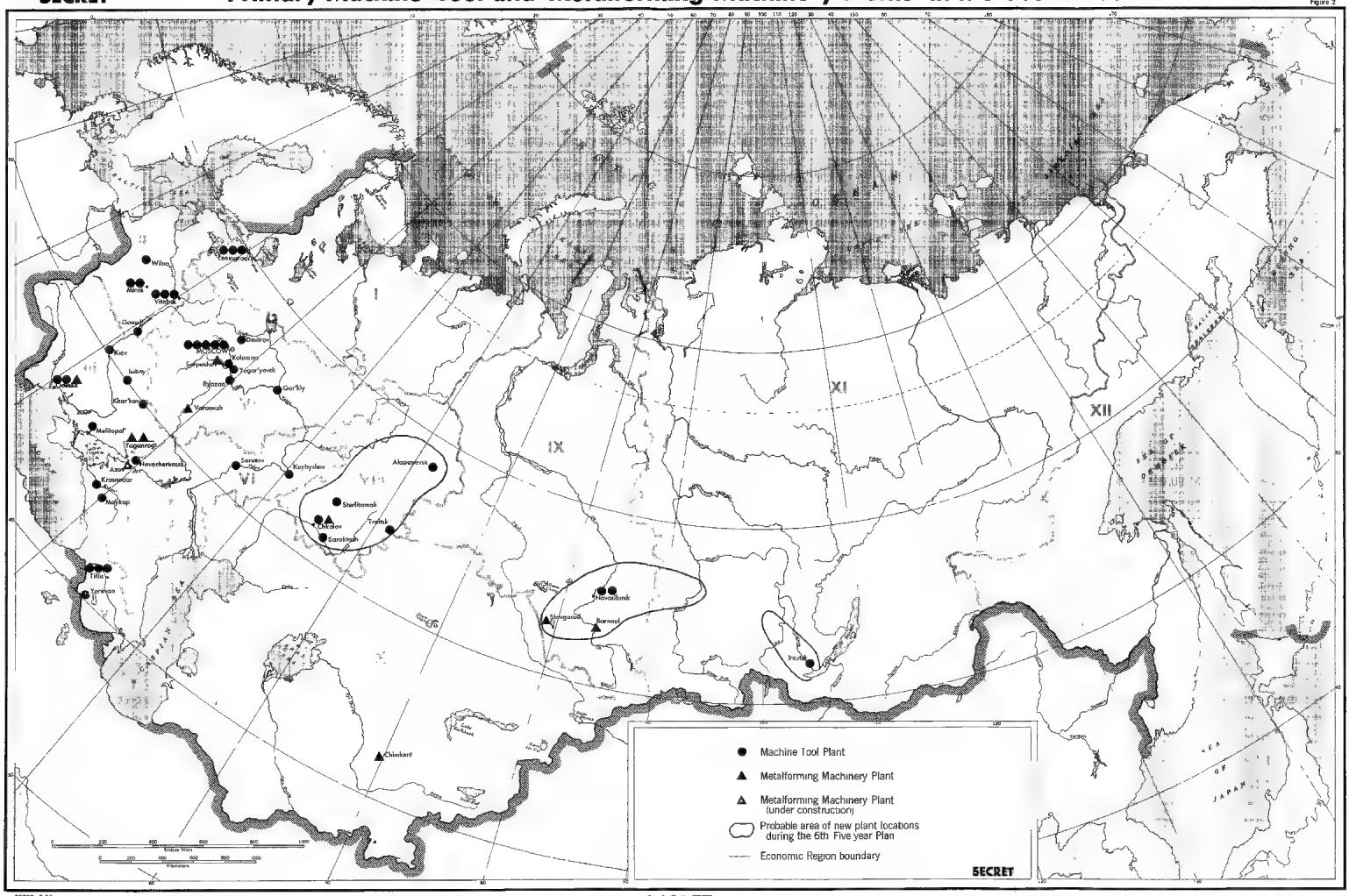
Primary Machine Tool and Metalforming Machinery Plants in the USSR–1955

Figure 2



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and Soviet production is not an accurate measure of the relative positions of the industries. Although the extent of the dissimilarity between the US and Soviet metalforming machinery industries cannot be determined, it is clear that the USSR could adequately supply its military and capital goods industries without equaling US production.

B. Comparison of Soviet and US Technology.

Soviet ability to design and build metalworking machinery is believed to equal that of the US. Intelligence drawn from Soviet technical journals, exploitation of Soviet-built machines, and observations of machines at trade fairs and Soviet plants show that the USSR is building many models equivalent to our latest types of hydraulic- and electronic-controlled machines. Photoelectric-controlled machines have been under development during the past 5 years. 8/ The electric-spark and anode-mechanical methods of metal removal are being used more extensively in the USSR than in the US. Research on and application of high-speed cutting with ceramic tools are further advanced in the USSR than in the US.

During the past few years, a large variety of advanced types of machine tools were designed to be produced during the Sixth Five Year Plan. These types included machine tools incorporating the latest type of automatic tracer controls. Analysis of the specifications of these machine tools, as given in Soviet technical journals, indicates that they are comparable to advanced US types which are now in production. Soviet production of precision* machine tools such as jig borers and optical-profile grinders is still meager, although increased production of such machine tools is within Soviet capabilities. The greater part of Soviet requirements for these types of machine tools is supplied by Switzerland and East Germany. It is not uncommon for US manufacturers to import similar types of precision machine tools.

The over-all level of Soviet technology in the building of metalforming machinery is not clearly known. Although Soviet engineers have had little practical experience in building heavy metalforming machinery,** they have a thorough grasp of the theoretical problems involved, as indicated by a study of Soviet technical journals.

* Based on Soviet terminology.

** Heavy metalforming machinery includes the following: drop hammers of 10 metric tons or over, double-acting hammers of 20,000 kilograms or over, and hydraulic presses of 10,000 metric tons or over.

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The development of a heavy forging press program, which is important to the aircraft industry, is entirely within Soviet capabilities, and, in fact, recent Soviet newspaper articles have revealed that a 30,000-metric-ton hydraulic press is now under construction in the USSR. 9/

C. Comparison of Soviet and US Inventory.

The Soviet inventory of machine tools is estimated to have been 1.5 million units in 1955. 10/ The estimate of Soviet production for 1956-60 is about 750,000 units. As much as one-third of this total production could be used for replacement of export -- a substantial increase for both uses -- and the USSR could still add 0.5 million machine tools to its inventory. Consequently, the Soviet inventory of machine tools could be approximately 2 million units by 1960, compared with the US inventory of 2.3 million units in late 1953. 11/ The US inventory in 1960 may reach 2.5 million to 2.6 million units, depending upon business conditions and defense requirements.

Although the Soviet inventory of machine tools in 1960 will be smaller than that of the US, a comparison may not be a true measure of the productive potential of the respective inventories. The chief Soviet advantages over the US in the use of machine tools are a result of the following factors:

1. There is a greater degree of standardization of end products in the USSR. This standardization facilitates the equipping of automatic lines and shops to produce long runs of end products such as automotive pistons and ball bearings. As a result, fewer machines are needed to produce equal numbers of end products.

2. In the USSR there is centralized control over the location of end production. Production of small quantities can be shifted to utilize idle machinery, even in nonrelated industries. As a result, fewer machines are needed.

Reports from the US Automation Team which visited the USSR in 1955 indicate that Soviet plant layout and techniques for handling materials are behind those of the US. Capabilities of operators appear to be roughly similar in both countries, although the USSR probably is training greater numbers. In 1960, however, the average age of the Soviet inventory of machine tools is expected to be significantly less than that of the US inventory.

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Because there are factors other than the intrinsic worth or technical capabilities of a machine tool which influence its productivity, comparisons of the productive potential of Soviet and US metalworking machinery should be made cautiously. Other factors which affect this productive potential favor the US. For example, more extensive use of precision casting, closed-die forging, and extrusion of metals in the US contributes to a reduction in subsequent machinery operations or eliminates them. The Soviet Sixth Five Year Plan is attempting to end this US superiority by an emphasis on the expansion of casting and forging facilities.

In view of the different advantages of each country, by 1960 the productive potentials of the Soviet and US inventories of machine tools will be approximately proportional to the size of the inventories, with the US maintaining a slight superiority.

No estimate of the Soviet inventory of metalforming machinery is available. This inventory is, however, substantially smaller than that of the US. The USSR is believed to be deficient in extrusion presses, large mechanical presses, and stretch-forming machines used for production of aircraft. Although the USSR has several large hydraulic forging presses, its inventory is small in comparison with that of the US. The Sixth Five Year Plan, however, calls for a fourfold increase in Soviet production of heavy metalforming machinery. 12/

The number of units in the Soviet inventory of metalforming machinery may not be an accurate measure of production potential, because of the large proportion of hammers and other less productive types of machines in the Soviet inventory. The planned construction of specialized forging and pressing workshops during the next 5 years 13/ probably will provide a greater degree of centralized control over the use of these machines, thereby increasing the potential of the Soviet inventory.

III. Implications of Planned Expansion.

A. Location.

In 1960, Soviet production of both machine tools and metalforming machinery is planned to exceed that of 1955 by 91 percent. Better use of existing plants is expected to provide 65 percent of the increase in production of machine tools and 29 percent of the

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increase in production of metalforming machinery. 14/ It is believed that the remainder of the increase in production will be a result of the construction of new plants or the expansion of existing plants.

The USSR plans to build new machine tool plants and 6 metalforming machinery plants in the Urals and Siberia. 15/ In addition, a new metalforming machinery plant is under construction at Azov. 16/

The new machine tool plants probably will be located in the Novosibirsk-Tomsk-Krasnoyarsk-Irkutsk areas* of western and central Siberia. According to the Sixth Five Year Plan, industrial development in the Urals and Siberia will be carried on at a higher rate than in other areas of the USSR. Two or three of the metalforming machinery plants probably will be located in the Urals to supply mechanical presses, shears, cold headers, and other equipment.

In addition to plants producing machine tools, plants producing railroad locomotives, rolling stock, roadbuilding machines, and building materials are to be built in central Siberia. The location of plants in this area agrees with Soviet plans to set up plants producing machinery near consuming areas. 17/

Figure 2** shows the present locations of primary metalworking machinery plants with possible new locations.

The shift of machine tool plants eastward will alter the proportion of machine tools produced in the Urals and Siberia from approximately 10 percent of the total in 1954 18/ to over 25 percent in 1960. No percentage breakdown of the location of production is available for the metalforming machinery industry. The location of 6 new plants in the Urals and Siberia, however, represents a large addition to the production facilities in those areas, and by 1960, 30 percent to 50 percent of all metalforming machinery produced in the USSR will be produced in the Urals and Siberia.

In addition to the importance of the new metalworking machinery plants to the development of the eastern areas of the USSR, the shift also will provide strategic dispersal of the Soviet metalworking machinery industry.

* These areas are shown by shading on the map, Figure 2, following p. 10.
** Following p. 10.

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B. Automation and Increased Productivity.

The Soviet Sixth Five Year Plan calls for a growth in industrial production of about 65 percent, including a 70-percent increase in the production of the means of production. A substantial portion of this growth is to result from increasing productivity, and this increase in productivity, in turn, is dependent upon the large planned increase in the production of metalworking machinery to be used in the automation of production processes.

The Plan has a special section on automation and "complex mechanization" to be undertaken as part of a program to surpass the US level of industrial productivity. This program is to be implemented by increased specialization in industry, modernization and replacement of obsolete equipment, and expansion of scientific and technical training, as well as by substantially increased production of automatic machinery and instruments.

During the period of the Plan, Soviet production of "specialized, special, and multipositional aggregate machine tools" is to increase by 2.4 times; of automatic and semiautomatic lines and equipment for automatic workshops, by approximately 5 times; and of instruments and means of automation, by approximately 3.5 times. In machine building alone, 220 automatic and semiautomatic lines and shops are to be commissioned. Thirty new instrument plants are to be built and commissioned, and production of "computing machines for automatic control of production processes" 19/ is to be increased.* A new Ministry of Instrument Building and Automation Equipment** has been created, and it is believed that this Ministry will concentrate on general types of precision equipment and instruments which have a wide application in the automation of production processes. Organizations under the Ministry of Machine Tool Building and Tool Industry*** are responsible for the development and production of new types of automatic machine tools, automatic lines, and transfer machinery.

* These Soviet intentions were mentioned by a member of the US Automation Team which visited the USSR.

** Ministerstvo Priborostroyeniya i Sredstv Avtomatizatsii.

*** Ministerstvo Stankostroitel'noy i Instrumental'noy Promyshlennosti.

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The USSR has been successfully designing and building the Detroit type* of automation. The Experimental and Scientific Research Institute for Metalcutting Machine Tools (ENIMS**) has designed these advanced automated lines. These lines are built at Stankokonstruktsiya, the experimental plant associated with ENIMS. A member of the US Automation Team made the following observation 20/:

> We saw a bearing line /Kaganovich Ball Bearing Plant/ that is completely automatic. The roller bearing forgings are put into hoppers at one end. They are completely machined, quenched, stabilized in a furnace, ground, inspected, assembled and wrapped in oiled paper and sealed without being touched by hand. This line is completely automated.

Members of the team went on to say that the work had been done very efficiently, and one member added, "I have never seen a better example of automation in my life."

Feed-back control automation, using closed-loop servomechanisms regulated by computer data, is not yet evident in Soviet machine tools.*** Soviet textbooks and articles in journals, however, indicate that there is strong interest in the theory, its applications, and problems of economic feasibility. ENIMS is in close liaison with the Institute of Automatics and Telemechanics,**** Academy of Sciences, USSR, which has been established to study problems of advanced automation. ENIMS undoubtedly will incorporate perfected feed-back control automation into machining processes as soon as possible.

In contrast to the increase in Soviet production of machine tools, the planned increase in production of metalforming machinery does not appear to be closely related to the automation program. Although some of the new presses and forging machines probably will

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* Mechanical transfer of components between integrated manufacturing operations.

** Eksperimental'nyy Nauchno-Issledovatel'skiy Institut Metallorezhushchikh Stankov.

*** This lack was specifically noted by the US Automation Team.

**** Institut Avtomatiki i Telemekhaniki.

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be used in automatic lines, the emphasis seems to be on modernizing a sector of the capital goods industry which has been relatively neglected.

It is difficult to assess the magnitude of the Soviet automation program or to compare it with US achievements. In the past, however, the USSR has given wide publicity to automatic installations in technical journals and at trade fairs and plant visits. If the USSR continues to publicize achievements in automation during the first years of the Sixth Five Year Plan, much more information can be collected on the magnitude of the automation program.

C. Replacement and Modernization.

The Sixth Five Year Plan announcement stressed the necessity of "extensive replacement and modernization of obsolete equipment" and of "renewing to a considerable extent the pool of metalworking machinery." 21/ The Soviet replacement policy appears to be receiving careful reexamination, and special attention is being paid to US industrial policy. The State Committee on New Technology (Gostekhnika) and the new deputy ministers of new technology in each economic ministry have been specifically charged with facilitating replacement and modernization. 22/

In the past, machine tools have not been replaced on a large scale. Plants have usually done their own repairing or have sent machine tools to rebuilding plants. Large machine tools with foundations below the ground level have been reconditioned by traveling repair brigades.

The Soviet inventory of machine tools contains numerous older belt-driven machine tools which were converted to motor-driven machine tools after World War II. Although no formula for determining retirement is available, these older machines probably will be retired first. Such a retirement program would require 15 to 20 percent of annual Soviet production of machine tools during the period of the Sixth Five Year Plan, or approximately 125,000 units. No extensive retirement of metalforming machinery is expected. Although work may be transferred from hammers to presses, the hammers probably will remain in service for use in ancillary production.

The substantial increase in Soviet production will give the USSR the capability to modernize its inventory of metalworking

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machinery so that the average age of Soviet machines will be significantly less than that of US machines. One result of this modernization program should be the lowering and equalization of metalworking costs, which are known to vary widely from plant to plant. 23/ Another result may be the release of used machine tools for export.

D. Foreign Trade.

In the past 5 years, almost all Soviet exports of machine tools have been to countries of the Sino-Soviet Bloc. Each of the members of the Bloc (with the exception of Albania) now is producing some machine tools, and the exports to the Bloc have been decreasing. Communist China, the largest recipient of Soviet exports, has reduced its imports and is becoming more selective. China's needs during the next 5 years, however, are not known. Soviet exports to the West have been insignificant.

Because Soviet production of machine tools probably will total 750,000 units over the next 5 years, the USSR will have the capacity to increase substantially its industrial base. At the same time, the USSR will be able to replace much of its inventory of obsolete machine tools and still retain the capacity to carry on a sizable export program if it so desires.

Sales of metalworking machinery to the West could be an important weapon of economic warfare, especially in underdeveloped areas. In early 1956, D.T. Shepilov, Chairman of the Foreign Affairs Committee of the Soviet of Nationalities, USSR, said that the reemphasis on heavy industry has helped to create a stockpile of capital goods for trade with underdeveloped countries. 24/

The USSR has been a substantial net importer of metalforming machinery. During the next 5 years, planned expansion will reduce Soviet dependence upon imports. Because of the planned construction of specialized forging and pressing workshops, the probable equipping of plants with new presses, and the present low level of production of metalforming machinery, however, no substantial amount of exports is expected.

Soviet imports of machine tools have become progressively smaller since World War II. At present, Soviet imports are made on a highly selective basis, limited chiefly to high-precision machine

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tools such as jig borers and gear grinders and to large vertical and horizontal boring mills and plano-milling machines. Although the USSR has the capability to produce its requirements for these machine tools, machine tools of comparable quality probably can be procured relatively more cheaply from other countries.

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APPENDIX A

METHODOLOGY

1. Soviet Production of Machine Tools.

Figures for Soviet production of machine tools during 1951-54 were taken from a CIA report. 25/ The figure for production in 1955 was calculated from the planned figure for 1960 (200,000 units), a figure announced as being 91 percent greater than production in 1955. Figures for production during 1956-59 are estimates which allow for increased production in the later years because of the construction of planned plants.

2. Soviet Production of Metalforming Machinery.

In January 1956 a Soviet newspaper announced that the goal for production of metalforming machinery in 1960 was 25,800 units, an increase of 91 percent over production in 1955. 26/ According to one report, 27/ production in 1955 increased 150 percent over production in 1950. Production between 1950 and 1955 was estimated by interpolation, and production during 1956-59 was estimated under the assumption that the major share of the planned increase would occur during 1958-60, when the new plants are to begin operations.

3. US Production of Machine Tools, 1955.

No unit figures for US production of machine tools in 1955 are available. The figures for production in 1955 were estimated by adjusting the available value figures by an average unit value figure for previous years adjusted to reflect estimated changes in value.

4. Soviet Retirement of Machine Tools.

A large portion of the Soviet inventory of machine tools is less than 25 to 30 years old, and the age distribution is skewed by the presence of large numbers of machine tools produced since World War II. In the past the USSR has undertaken no large-scale replacement of machine tools. Retirement of obsolete machine tools which are not fully worn out seems to be only in the discussion stage. Because the

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Soviet inventory contains numerous older belt-driven machine tools which were converted to motor-driven machine tools after World War II, it is probable that these machine tools will be retired first. The estimated retirement will equal 15 to 20 percent of annual Soviet production of machine tools during the period of the Sixth Five Year Plan, or approximately 125,000 units.

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APPENDIX B

GAPS IN INTELLIGENCE

A more detailed comparison of the US and Soviet metalworking machinery industries is prevented by a lack of information concerning the following:

1. US unit production of machine tools and metal-forming machinery by types.

2. The distribution of Soviet production of metalworking machinery by types, especially the number of newer types of machine tools being produced.

3. An adequate and precise definition of the Soviet metalforming machinery industry.

Information on the Soviet inventory of metalforming machinery is fragmentary as regards both total quantity and types.

More complete information is needed on the amount and nature of production at Soviet metalforming machinery plants as well as on the number of metalforming machines produced at secondary plants.

Almost no information is available on the planned Soviet replacement policy during the Sixth Five Year Plan. This information is required for accurate estimates of the Soviet inventories of machine tools and metalforming machinery.

Information is needed on the planned location, amount and nature of production, and status of construction of the 11 new metalworking machinery plants in the Urals and Siberia.

Information is also needed on the Soviet automation program, its direction, and especially the actual, as opposed to the reported, authority of Gostekhnika.

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APPENDIX C

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this memorandum. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

All sources are evaluated RR 2 unless otherwise indicated.

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